

IN THE CLAIMS

1. **(Previously Presented)** A bone anchor, comprising:
a self-drilling screw portion configured to penetrate a bone, the screw portion comprising:
a retention thread extending at least part of a length of the screw portion; and
a tip at a first end of the screw portion;
a protrusion adjacent a second end of the screw portion, the second end opposite the first end of the screw portion, the protrusion comprising:
a plurality of external sides forming a shape; and
a rounded interior surface enclosing a protrusion recess, the rounded interior surface including a single, continuous recess thread extending a majority of a length of the protrusion recess, the recess thread being configured to rotatably retain a threaded component at least partially in the protrusion recess; and
the protrusion having a maximum width that is less than a maximum diameter of the screw portion such that a shoulder is formed where the protrusion meets the second end of the screw portion.
2. **(Previously Presented)** The bone anchor of Claim 39, wherein the screw portion comprises a conical shape.
3. **(Previously Presented)** The bone anchor of Claim 39, wherein the screw portion further comprises at least one cutting flute extending at least part of the length of the screw portion through the retention thread.
4. **(Previously Presented)** The bone anchor of Claim 39, wherein the screw portion further comprises first and second cutting flutes approximately 180° apart.
5. **(Previously Presented)** The bone anchor of Claim 39, wherein the shape comprises a hexagonal shape.

6. **(Previously Presented)** The bone anchor of Claim 39, wherein the shape comprises a cruciform shape.

7. **(Previously Presented)** The bone anchor of Claim 39, wherein the shape comprises an approximate D-shape.

8. **(Previously Presented)** The bone anchor of Claim 39, where the shape comprises an approximate square.

9. **(Previously Presented)** The bone anchor of Claim 39, wherein the shape comprises an approximate triangle.

10. **(Previously Presented)** The bone anchor of Claim 39, further comprising a length of approximately 0.20 inch.

11. **(Previously Presented)** The bone anchor of Claim 39, wherein the threaded component comprises a fiducial marker component.

12. **(Previously Presented)** A driver for inserting a bone anchor into a bone, comprising:

a tip portion having a first diameter, the tip portion comprising:

a driver edge;

an external surface; and

a plurality of internal surfaces enclosing a driver recess, wherein the plurality of internal surfaces form a shape;

wherein the driver recess is configured to retain an insert positioned at least partially within a threaded protrusion recess of the protrusion of the bone anchor to provide a friction fit between the driver and the bone anchor during insertion of the bone anchor;

a second portion adjacent the tip portion, the second portion having a second diameter, the second diameter greater than the first diameter such that a rim is formed where the tip portion meets the second portion; and

wherein the tip portion positions around a protrusion of a bone anchor when the driver is used to insert the bone anchor into a bone, the driver edge contacting a shoulder of the bone anchor during insertion.

13. **(Canceled)**

14. **(Previously Presented)** The driver of Claim 12, wherein the insert comprises silicon.

15. **(Previously Presented)** A driver for inserting a bone anchor into a bone, comprising:

a tip portion having a first diameter, the tip portion comprising:

a driver edge;

an external surface; and

a plurality of internal surfaces enclosing a driver recess, wherein the plurality of internal surfaces form a shape;

a second portion adjacent the tip portion, the second portion having a second diameter, the second diameter greater than the first diameter such that a rim is formed where the tip portion meets the second portion;

wherein the tip portion positions around a protrusion of a bone anchor when the driver is used to insert the bone anchor into a bone, the driver edge contacting a shoulder of the bone anchor during insertion; and

wherein a distance between the driver edge and the rim is approximately equal to a distance between the shoulder of the bone anchor and an end of the protrusion such that when the rim contacts a surface of the bone during insertion the end of the protrusion will be approximately level with the surface of the bone.

16. **(Original)** The driver of Claim 12, wherein the shape comprises a hexagonal shape.

17. **(Withdrawn)** A system for inserting a bone anchor into a bone, comprising:
a bone anchor comprising:
a screw portion configured to penetrate a bone, the screw portion comprising:
a retention thread extending at least part of a length of the screw portion; and
a tip at a first end of the screw portion;
a protrusion adjacent a second end of the screw portion, the second end opposite the first end of the screw portion, the protrusion comprising:
a plurality of external sides forming a shape; and
a rounded interior surface enclosing a protrusion recess, the rounded interior surface including a recess thread configured to retain a component at least partially in the protrusion recess when inserted into the bone; and
the protrusion having a maximum width that is less than a maximum diameter of the screw portion such that a shoulder is formed where the protrusion meets the second end of the screw portion; and
a driver comprising:
a tip portion having a first diameter, the tip portion comprising:
a driver edge;
an external surface; and
a plurality of internal surfaces enclosing a driver recess, wherein the plurality of internal surfaces form the shape;
a second portion adjacent the tip portion, the second portion having a second diameter, the second diameter greater than the first diameter such that a rim is formed where the tip portion meets the second portion;
wherein the tip portion positions around the protrusion when the driver is used to insert the bone anchor into the bone, the driver edge contacting the shoulder during insertion; and
wherein a distance between the driver edge and the rim of the driver is approximately equal to a distance between the shoulder and an end of the protrusion of the bone anchor such that when the rim contacts a surface of the bone during insertion the end of the protrusion will be approximately level with the surface of the bone.

18. **(Withdrawn)** The system of Claim 17, wherein the driver recess is configured to retain an insert configured to position at least partially within the protrusion recess to provide a friction fit between the driver and the bone anchor during insertion of the bone anchor.

19. **(Withdrawn)** The system of Claim 18, wherein the insert comprises silicon.

20. **(Withdrawn)** The system of Claim 17, wherein the shape comprises a hexagonal shape.

21. **(Withdrawn)** The system of Claim 17, wherein the screw portion comprises a conical shape.

22. **(Withdrawn)** The system of Claim 17, wherein the screw portion further comprises at least one cutting flute extending at least part of the length of the screw portion through the retention thread.

23. **(Withdrawn)** The system of Claim 17, wherein the bone anchor comprises a length of approximately 0.20 inch.

24. **(Withdrawn)** The system of Claim 17, wherein the component comprises a fiducial marker component.

25. **(Withdrawn)** A method for inserting a bone anchor into a bone, comprising:
coupling a driver to a bone anchor by positioning a tip portion of the driver around a protrusion of the bone anchor such that a driver edge of the driver contacts a shoulder of the bone anchor;

wherein the bone anchor comprises:

a screw portion configured to penetrate a bone, the screw portion comprising:

a retention thread extending at least part of a length of the screw portion; and

tip at a first end of the screw portion;

the protrusion adjacent a second end of the screw portion, the second end opposite the first end of the screw portion, the protrusion comprising:

a plurality of external sides forming a shape; and

a rounded interior surface enclosing a protrusion recess, the rounded interior surface including a recess thread configured to retain a component at least partially in the protrusion recess when inserted into the bone; and

the protrusion having a maximum width that is less than a maximum diameter of the screw portion such that the shoulder is formed where the protrusion meets the second end of the screw portion;

wherein the driver comprises:

the tip portion having a first diameter, the tip portion comprising:

the driver edge;

an external surface; and

a plurality of internal surfaces enclosing a driver recess, wherein the plurality of internal surfaces form the shape; and

a second portion adjacent the tip portion, the second portion having a second diameter, the second diameter greater than the first diameter such that a rim is formed where the tip portion meets the second portion;

rotating the driver such that the bone anchor penetrates and screws into the bone until the rim contacts a surface of the bone, wherein a distance between the driver edge and the rim of the driver is approximately equal to a distance between the shoulder and an end of the protrusion of the bone anchor such that when the rim contacts the surface of the bone the end of the protrusion will be approximately level with the surface of the bone; and

decoupling the driver from the bone anchor.

26. **(Withdrawn)** The method of Claim 25, further comprising inserting the component into the protrusion recess, the component comprising a fiducial marker component.

27. **(Withdrawn)** The method of Claim 25, wherein the driver recess is configured to retain an insert positioned at least partially within the protrusion recess to provide a friction fit between the driver and the bone anchor during rotation of the bone anchor.

28. **(Withdrawn)** The method of Claim 25, wherein the shape comprises a hexagonal shape.

29. **(Withdrawn)** The method of Claim 25, wherein the screw portion further comprises at least one cutting flute extending at least part of the length of the screw portion through the retention thread.

30. **(Previously Presented)** A bone anchor, comprising:
a self-drilling screw portion configured to penetrate a bone, the screw portion comprising a retention thread extending at least part of a length of the screw portion;
a protrusion adjacent the screw portion, the protrusion enclosing a threaded recess having a single, continuous thread extending a majority of a length of the threaded recess, the threaded recess being configured to rotatably retain a threaded component at least partially in the threaded recess; and
a shoulder where the screw portion meets the protrusion.

31. **(Previously Presented)** The bone anchor of Claim 40, wherein the threaded component comprises a fiducial marker component.

32. **(Previously Presented)** The bone anchor of Claim 40, wherein the protrusion comprises a hexagonal shape.

33. **(Withdrawn)** A system for inserting a bone anchor into a bone, comprising:
a bone anchor comprising:
a screw portion configured to penetrate a bone, the screw portion comprising a retention thread extending at least part of a length of the screw portion;
a protrusion adjacent the screw portion, the protrusion enclosing a threaded recess configured to retain a component at least partially in the threaded recess; and
a shoulder where the protrusion meets the screw portion; and
a driver configured to engage the protrusion for insertion of the bone anchor into a bone, the driver comprising:
a driver edge contacting the shoulder during the insertion; and
a rim positioned approximately level with an end of the protrusion when the driver is engaged with the protrusion such that when the rim contacts a surface of the bone during the insertion the end of the protrusion will be approximately level with the surface of the bone.

34. **(Withdrawn)** The system of Claim 33, wherein the component comprises a fiducial marker component.

35. **(Withdrawn)** The system of Claim 33, wherein the protrusion comprises a hexagonal shape.

36. **(Previously Presented)** A bone anchor, comprising:
a self-drilling and self-tapping screw portion comprising:
a retention thread extending at least part of a length of the screw portion; and
a tip at a first end of the screw portion; and
a component retaining portion adjacent the screw portion, the component retaining portion comprising a threaded interior surface enclosing a recess, the threaded interior surface comprising a single, continuous thread extending a majority of a length of the recess, the recess being configured to rotatably retain a threaded surgical component at least partially within the recess.
37. **(Previously Presented)** The bone anchor of Claim 41, wherein the threaded surgical component comprises a fiducial marker component.
38. **(Previously Presented)** The bone anchor of Claim 41, wherein the screw portion further comprises at least one cutting flute extending at least part of the length of the screw portion.
39. **(Previously Presented)** The bone anchor of Claim 1, wherein the shoulder further comprises a continuous shoulder surface extending around the protrusion, the entire shoulder surface being oriented generally perpendicular to a longitudinal axis of the screw portion.
40. **(Previously Presented)** The bone anchor of Claim 30, wherein the shoulder further comprises a continuous shoulder surface extending around the protrusion, the entire shoulder surface being oriented generally perpendicular to a longitudinal axis of the screw portion.
41. **(Previously Presented)** The bone anchor of Claim 36, further comprising a shoulder where the screw portion meets the component retaining portion, the shoulder comprising:
a continuous shoulder surface extending around the protrusion, the entire shoulder surface being oriented generally perpendicular to a longitudinal axis of the screw portion.

42. **(Previously Presented)** A driver for inserting a bone anchor into a bone, comprising:

a tip portion having a first diameter, the tip portion comprising:

a driver edge;

an external surface; and

a plurality of internal surfaces enclosing a driver recess, wherein the plurality of internal surfaces form a hexagonal shape;

a silicon insert retained in the driver recess and positioned at least partially within a threaded protrusion recess of a protrusion of the bone anchor to provide a friction fit between the driver and the bone anchor during insertion of the bone anchor;

a second portion adjacent the tip portion, the second portion having a second diameter, the second diameter greater than the first diameter such that a rim is formed where the tip portion meets the second portion;

wherein the tip portion positions around a protrusion of a bone anchor when the driver is used to insert the bone anchor into a bone, the driver edge contacting a shoulder of the bone anchor during insertion;

wherein the first diameter is approximately equal to a shoulder diameter of the shoulder of the bone anchor; and

wherein a distance between the driver edge and the rim is approximately equal to a distance between the shoulder of the bone anchor and an end of the protrusion such that when the rim contacts a surface of the bone during insertion the end of the protrusion will be approximately level with the surface of the bone.

43 **(Previously Presented)** The driver of Claim 12, further comprising an insert retained in the driver recess and positioned at least partially within a threaded protrusion recess of the protrusion of the bone anchor to provide a friction fit between the driver and the bone anchor during insertion of the bone anchor.

44. **(Previously Presented)** The driver of Claim 43, wherein the insert comprises silicon.

45. **(Previously Presented)** The driver of Claim 12, wherein the first diameter is approximately equal to a shoulder diameter of the shoulder of the bone anchor.

46. **(Previously Presented)** The driver of Claim 12, wherein a distance between the driver edge and the rim is approximately equal to a distance between the shoulder of the bone anchor and an end of the protrusion such that when the rim contacts a surface of the bone during insertion the end of the protrusion will be approximately level with the surface of the bone.

47. **(Previously Presented)** A bone anchor, comprising:
a screw portion having a conical shape and being configured to penetrate a bone, the screw portion comprising:
a retention thread extending at least part of a length of the screw portion; and
a tip at a first end of the screw portion;
a first and a second cutting flute approximately 180° apart, each cutting flute extending at least part of a length of the screw portion through the retention thread; and
wherein the retention thread comprises a lead angle approximately equal to 50° and a trailing angle approximately equal to 80°, the lead and the trailing angle each being measured from a longitudinal axis of the screw portion;
a protrusion adjacent a second end of the screw portion, the second end opposite the first end of the screw portion, the protrusion comprising:
a plurality of external sides forming a hexagonal shape;
a rounded interior surface enclosing a protrusion recess, the rounded interior surface including a single, continuous recess thread extending a majority of a length of the protrusion recess, the recess thread being configured to rotatably retain a threaded fiducial marker component at least partially in the protrusion recess;
a top surface having a rounded edge;
wherein the protrusion has a maximum width approximately equal to 0.077 inch, the maximum width being less than a maximum diameter of the screw portion such that a shoulder is formed where the protrusion meets the second end of the screw portion;
wherein the shoulder further comprises a continuous shoulder surface extending around the protrusion, the entire shoulder surface being oriented generally perpendicular to the longitudinal axis of the screw portion; and
wherein the protrusion recess has an entrance comprising a chamfered interior surface; and
wherein the bone anchor has a length of approximately 0.20 inch.

48. **(Previously Presented)** The bone anchor of Claim 39, wherein the protrusion further comprises a top surface having a rounded edge.

49. **(Previously Presented)** The bone anchor of Claim 39, wherein the protrusion recess has an entrance comprising a chamfered interior surface.

50. **(Previously Presented)** The bone anchor of Claim 39, wherein the protrusion has a maximum width approximately equal to 0.077 inch.

51. **(Previously Presented)** The bone anchor of Claim 39, wherein the retention thread comprises a lead angle approximately equal to 50° and a trailing angle approximately equal to 80° , the lead and the trailing angle each being measured from a longitudinal axis of the screw portion.